

WHAT IS CLAIMED IS:

1. A breathing gas system comprising:

a primary breathing gas source;

5 a primary gas delivery passageway for conveying breathing gas at a first operating pressure, the passageway in fluid communication with the primary breathing gas source and a breathing mask;

a check valve disposed in the primary gas delivery
10 passageway;

a first valve responsive to primary breathing gas pressure, the first valve having a chamber in fluid communication with the primary gas delivery passageway, the first valve having a first valve passageway capable
15 of alternating between an open and closed configuration, in the open configuration the first valve passageway is in fluid communication with an inlet to a first flow restrictor leading to a vent;

a second valve responsive to primary breathing gas
20 pressure, the second valve having a chamber disposed in fluid communication with the outlet of a second flow restrictor, the second flow restrictor having an inlet in fluid communication with the primary gas delivery

passageway, the chamber also disposed in fluid communication with the passageway in the first valve, the second valve having a passageway capable of alternating between an open and closed configuration, in
5 the open configuration the passageway is in fluid communication with a secondary breathing gas source and is in fluid communication with the breathing mask;

the secondary breathing gas source capable of delivering secondary breathing gas at a second operating
10 pressure; and,

wherein the first and second valves are normally closed by the pressure of the primary breathing gas until a reduction of the primary breathing gas pressure causes the first valve to open, the opening of the first
15 valve resulting in the primary breathing gas flowing to the vent, the venting of the primary breathing gas from the chamber of the second valve causing the second valve to open which allows secondary breathing gas to flow to the breathing mask.

20

2. The system of Claim 1, wherein the second operating pressure is greater than the first operating pressure.

3. The system of Claim 1, wherein the secondary air source comprises a compressed gas cylinder.

4. The system of Claim 1, wherein the breathing mask includes a respiration on demand valve.

5. The system of Claim 1, further comprising an alarm responsive to increased gas pressure.

10 6. The system of Claim 5, wherein the alarm is mounted in the breathing regulator.

7. The system of Claim 1, wherein the second valve is opened when the gas pressure on the back side of the second valve falls below a predetermined level.

8. The breathing system of Claim 1, wherein the first valve is a poppet valve.

20 9. The breathing system of Claim 1, wherein the second valve is a poppet valve.

10. The breathing system of Claim 1, wherein the first

flow restrictor has a greater flow rate than the second flow restrictor.

11. The breathing system of Claim 1, wherein the first
5 flow restrictor has a flow rate of about 1,000 cc/min.

12. The breathing system of Claim 1, wherein the second flow restrictor has a flow rate of about 250 cc/min.

10 13. The breathing system of Claim 1, wherein the first operative pressure is about 80 to 110 psi.

14. The breathing system of Claim 1, wherein the second operative pressure is about 140-160 psi.

15

15. The breathing system of Claim 1, wherein the system resets automatically when pressure from the hose line that is communicated to the first valve causes the first valve to close thereby shutting off flow to the first
20 flow restrictor, the shutting off of flow to the first flow restrictor causing pressure to build up on the back side of the second valve causing the second valve to close.

16. A breathing gas system comprising:

a primary cylinder containing breathing gas, the primary cylinder being disposed in fluid communication with a primary cylinder regulator for reducing the cylinder gas pressure to a first operating pressure;

a primary gas delivery passageway for conveying breathing gas at the first operating pressure, the passageway in fluid communication with an outlet of the primary regulator and in fluid communication with a breathing mask;

a check valve disposed in the primary gas delivery passageway;

a first valve responsive to primary breathing gas pressure, the first valve having a chamber in fluid communication with the primary gas delivery passageway, the first valve having a first valve passageway capable of alternating between an open and a closed configuration, in the open configuration the first valve passageway is in fluid communication with an inlet to a first flow restrictor leading to a vent, the first valve having a spring-biased poppet that is normally closed by gas pressure at the first operating pressure such that if the pressure decreases below a predetermined value,

the first valve opens due to the force of the spring;

a second valve responsive to primary breathing gas pressure, the second valve having a chamber disposed in fluid communication with the outlet of a second flow restrictor, the second flow restrictor having an inlet
5 in fluid communication with the primary gas delivery passageway, the chamber also disposed in fluid communication with the passageway in the first valve, the second valve having a passageway capable of
10 alternating between an open and closed configuration, in the open configuration the passageway is in fluid communication with a secondary breathing gas source and is in fluid communication with the breathing mask; the secondary breathing source comprising an escape
15 cylinder mounted on the user capable of delivering a secondary breathing gas at a second operating pressure; and,

wherein the first and second valves are normally closed by the gas pressure of the primary breathing gas
20 source until a reduction of the primary breathing gas pressure causes the first valve to open, the opening of the first valve causing the primary breathing gas to flow to the vent, the venting of the primary breathing

gas from the chamber of the second valve causing the second valve to open such that secondary breathing gas flows from the secondary breathing source to the breathing mask.

5

17. The system of Claim 16, wherein the second operating pressure is greater than the first operating pressure.

10 18. The system of Claim 16, wherein the breathing mask includes a respiration on demand valve.

19. The system of Claim 16, further comprising an alarm responsive to increased gas pressure.

15

20. The system of Claim 19, wherein the alarm is mounted in the breathing regulator.

21. The system of Claim 16, wherein the second valve is
20 opened when the gas pressure on the back side of the second valve falls below a predetermined level.

22. The breathing system of Claim 16, wherein the first

valve is a poppet valve.

23. The breathing system of Claim 16, wherein the second valve is a poppet valve.

5

24. The breathing system of Claim 16, wherein the first flow restrictor has a greater rate than the second flow restrictor.

10 25. The breathing system of Claim 16, wherein the first flow restrictor has a flow rate of about 1,000 cc/min.

26. The breathing system of Claim 16, wherein the second flow restrictor has a flow rate of about 250
15 cc/min.

27. The breathing system of Claim 16, wherein the first operative pressure is about 80 to 110 psi.

20 28. The breathing system of Claim 16, wherein the second operative pressure is about 140-160 psi.

29. A breathing gas system, comprising:

a primary breathing gas cylinder having a primary regulator for reducing the cylinder pressure to a first operating pressure;

5 a primary gas delivery passageway for conveying breathing gas at the first operating pressure from the primary gas cylinder to an on demand regulator operatively associated with a breathing mask;

a check valve disposed in the primary gas delivery passageway;

10 a first valve responsive to primary breathing gas pressure, the first valve having a chamber in fluid communication with the primary gas delivery passageway, the first valve having a first valve passageway capable of alternating between an open and a closed
15 configuration, in the open configuration the first valve passageway is in fluid communication with an inlet to a first flow restrictor leading to a vent, the first valve having a spring-biased poppet that is normally closed by gas pressure at the first operating pressure such that
20 if the pressure decreases below a predetermined value, the first valve opens due to the force of the spring;

a second valve responsive to primary breathing gas pressure, the second valve having a chamber disposed in

fluid communication with breathing gas from the primary gas delivery passageway through a second flow restrictor and in fluid communication with an inlet to the first valve passageway, the second valve having a second valve passageway in fluid communication with an outlet of a pressure reducer and in fluid communication with the demand-type regulator mounted on the mask, the second valve having an open and a closed configuration, the gas pressure from the primary gas delivery passageway causing the valve to remain in the closed position, the valve capable of moving to the open position in response to a reduction in the gas pressure within the chamber, the opening of the second valve causing secondary breathing gas to flow to the regulator on the breathing mask, the check valve preventing secondary breathing gas from exiting through the primary gas delivery passageway.